REPORT NO. 81-2-26
ALEXANDRIA FIELD OFFICE

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EVALUATION OF OAK MORTALITY ON THE OZARK NATIONAL FOREST ARKANSAS, 1981

SOUTHEASTERN AREA, STATE AND PRIVATE FORESTRY
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Prepared by: _____
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EVALUATION OF OAK MORTALITY ON THE OZARK NATIONAL FOREST ARKANSAS, 1981

by

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Abstract

A serious oak dieout problem was reported by personnel from the Ozark NF. Based on aerial survey data, 43 ground plots were sampled. A strong association between Hypoxylon and dead trees was observed but cause of death is not attributed to that fungus. Since few living trees were observed with Hypoxylon colonization, it appears that weakened trees are attacked about the time of death. Drought appears to be the prime cause of the oak problem in this area.

INTRODUCTION

A large number of oak trees scattered over the Ozark National Forest failed to leaf out normally, or were dead, in the spring of 1981. Mortality was widespread and heavy in some areas. Ozark NF personnel requested that an evaluation be made by Forest Pest Management to determine the amount and cause of damage on the Forest.

Suspicion of causality rested on last summer's severe drought, with the possibility that the effect of water stress was compounded by species of Hypoxylon. Reports from several areas in Arkansas indicated a discontinuous observation of Hypoxylon on dead trees, and also a selective attack by the fungus on red oaks (over white oaks) and mature rather than young trees.

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This evaluation was undertaken to determine information relative to the dieout problem. Specific questions to be answered included: is the dieout selective (red vs. white oaks, or older vs. younger trees)?, is Hypoxylon sp. a constant feature of this dieout problem?, are there other fungi or insects involved?

METHODS

An aerial detection survey was made by the Doraville Field Office in July, 1981. Flights were made at 5 mile intervals over the Bayou, Buffalo, Pleasant Hill, Magazine Mountain and Boston Mountain Ranger Districts. Mortality areas were reported as heavy or light (USDA For. Serv., S&PF Rept. SA-81-3-10).

A ground survey was planned from these maps by locating sample points in accessible areas of heavy mortality. Of these points, 43 were visited in the field. The ten oak trees nearest the selected plot center, 5 live, 5 dead, were observed. Height to the nearest foot and DBH to the nearest inch were recorded. Trees were designated as belonging either to the white oak or red oak group. Trees were rated as dead or alive. Boles were rated for the presence or absence of obvious Hypoxylon sp. fruiting. Other insects, diseases or adverse conditions were noted when appropriate. Wood chips were removed from the boles of all dead trees on plots 1-10, 21-29 and from the 2nd and 5th dead trees on plots 11-20 and 30-43 for laboratory analysis. Cultures of these wood chips were made in the lab and all fungi growing from the wood were identified.

RESULTS

Summaries of the basic tree data are presented in tables 1 - 3. Table 1 is a subgenus x survival cross tabulation. The distribution of live vs. dead is not statistically different for the red and white oak populations. Table 2 contains a summary of the canker incidence on live and dead, red and white oak. The bulk of the Hypoxylon seen was on dead oak trees. Table 3 presents a summary of the DBH and height data broken down for live vs. dead red or white oaks. No significant difference was seen between the red and white oak populations or the live and dead populations.

In table 4 we present a listing of the fungi cultured from the oak samples. All these fungi are common wood inhabiting fungi on dead trees. None are reported to cause disease on oak.

Figure 1 is a map of field sample locations.

In figure 2 are presented DBH and height class distributions for live vs. dead oak without considering the red/white categories. Figure 3 refines these data separating the data for the red and white oak samples. Reflected in these graphs is the fact that there is no significant size difference between the live and dead oaks sampled.

In figures 4 and 5 are shown the graphs representing percentages of trees (white, red or all oak) in the specified DBH (fig. 4) or height (fig. 5)

category. As in the previous analyses, no significant differences are to be seen here among the overall population (all oaks) and the four subpopulation graphs presented.

In figures 6 and 7 are presented comparisons of the DBH and height relationships of cankering on the dead oak population. While the curves follow the overall population trends for both the red and white oak groups, there appear to be fewer white oaks affected. While this observation is reflected in table 1 data it is not supported statistically. Statistically there was no difference in the red and white oak samples.

Typical drought symptoms were observed on many trees in this area; marginal browning of the leaves, followed by death of the leaf, generally with the dead leaves persisting on the affected tree.

No insects, other than secondary borers, were seen.

DISCUSSION

No disease or insect was observed causing the oak mortality in the Ozark NF. Hypoxylon, although highly visible on the dead oaks, was seen only on three living trees. While Hypoxylon may attack weakened oak and possibly contributes to the rate at which death occurs, the data taken do not suggest it as the primary cause of mortality; more than half of the dead trees were uncankered.

Typical drought symptoms seen on many of the oaks are similar to those caused by the oak wilt fungus. The causal fungus of oak wilt was not isolated from the samples. Based on this laboratory work, oak wilt is not believed to have caused the symptoms or mortality which were observed.

Drought appears to be an important, and probably the prime factor in the oak dieout problem. Last summer's extended drought compounded by periods of low rainfall this summer is sufficient to explain the dieout. Scattering of the dieout results from specific microsite differences and the genetic tolerance of individual trees to drought.

There is nothing which can be done to prevent this loss. Care should be taken to remove infected dead trees in high use areas since the Hypoxylon is a sapwood rotter which will rapidly reduce the structural integrity of these trees.

Table 1. Cross tabulation of survival data by subgenus of 430 oaks sampled on the Ozark NF.

	White	Red	All
Living	135	80	215
Dead	126	89	215
All Oak	261	169	430

Table 2. Summary of canker data descriptive of the oaks sampled in Arkansas.

	White Oak			Red Oak			All Oak		
	Live	Dead	All	Live	Dead	All	Live	Dead	All
Cankered	2	40	42	1	44	45	3	84	87
Not Cankered	133	86	219	79	45	124	212	131	343
	135	126	261	80	89	169	215	215	430

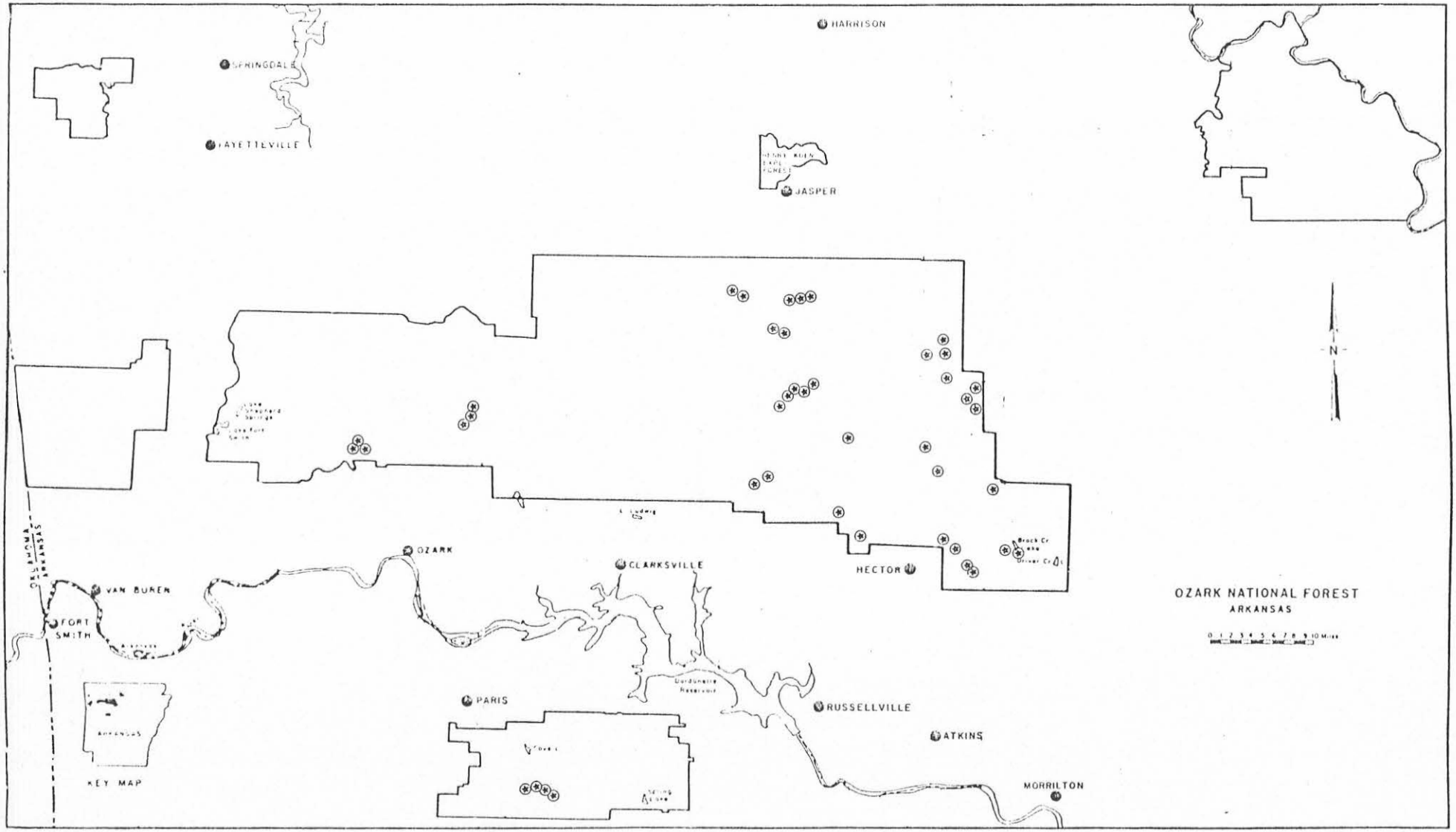
Table 3. Statistical summary of DBH and height information collected for Ozark NF oak population.

		Live	Dead	Total
White Oak	DBH	9.11 ± 4.26	9.65 ± 3.77	9.37 ± 4.03
	Height	45.41 ± 9.14	44.15 ± 9.96	44.80 ± 9.55
Red Oak	DBH	9.54 ± 3.25	8.94 ± 3.39	9.23 ± 3.33
	Height	46.14 ± 9.33	42.22 ± 8.04	44.08 ± 8.87
All Oak	DBH	9.27 ± 3.91	9.36 ± 3.77	9.31 ± 3.77
	Height	45.68 ± 9.20	43.35 ± 9.24	44.52 ± 9.28

Table 4. Fungi isolated from samples of dead oak taken during the evaluation of oak mortality on the Ozark NF.

	Frequency
Alternaria sp.	23
Brachysporium sp.	2
Chaetomella sp.	2
Dothiorella sp.	12
Epicoccum sp.	1
Nigrospora sp.	1
Pestalotia sp.	4
Phomopsis sp.	1
Rhizoctonia sp.	3
Torula sp.	2
Wardomyces sp.	1
Unknown	12

Figure 1. Distribution of the 43 field plots.



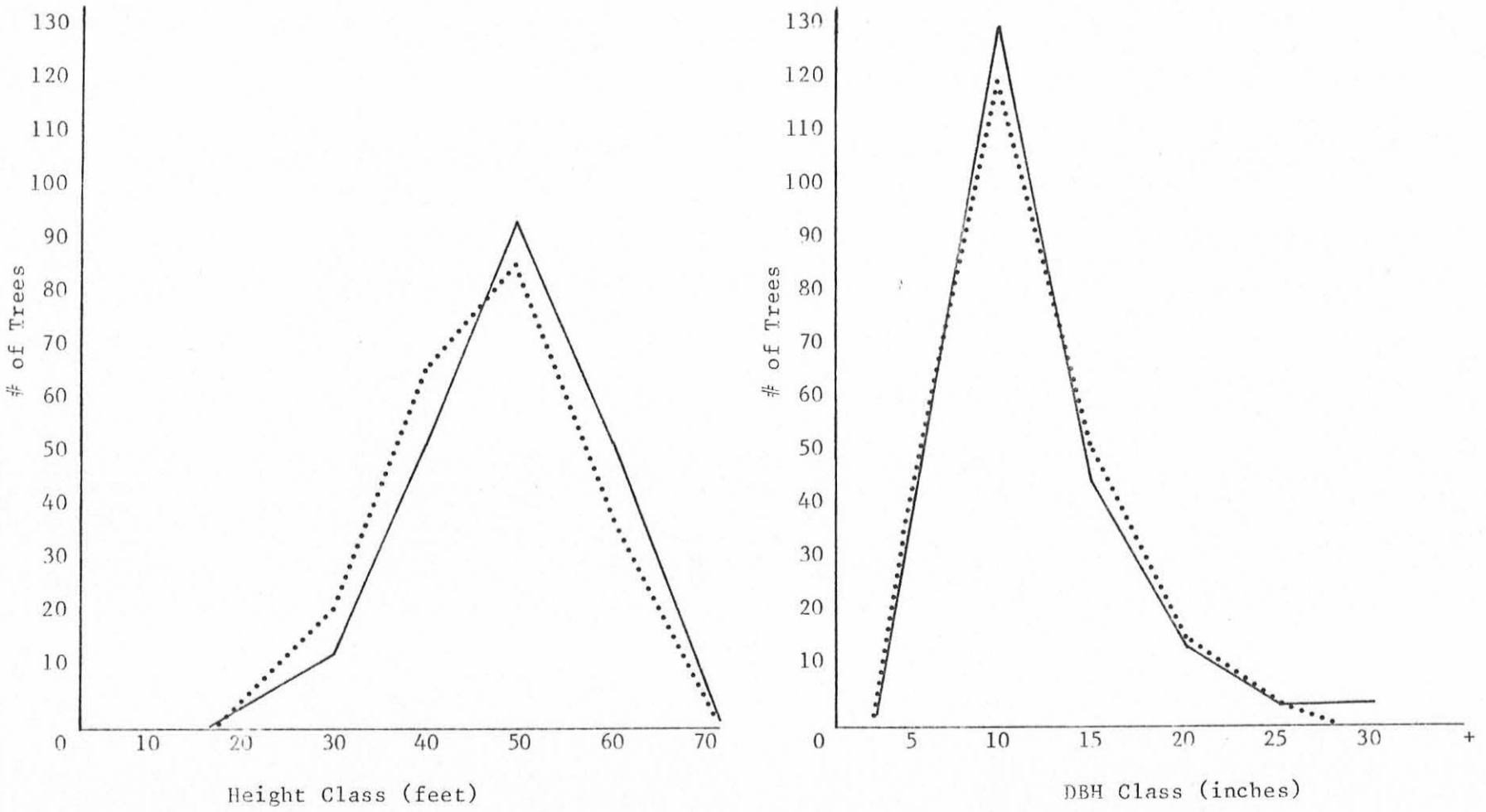


Figure 2. Summary of the distribution of live (——) and dead (.....) oak within 10' height classes and 5" DBH classes.

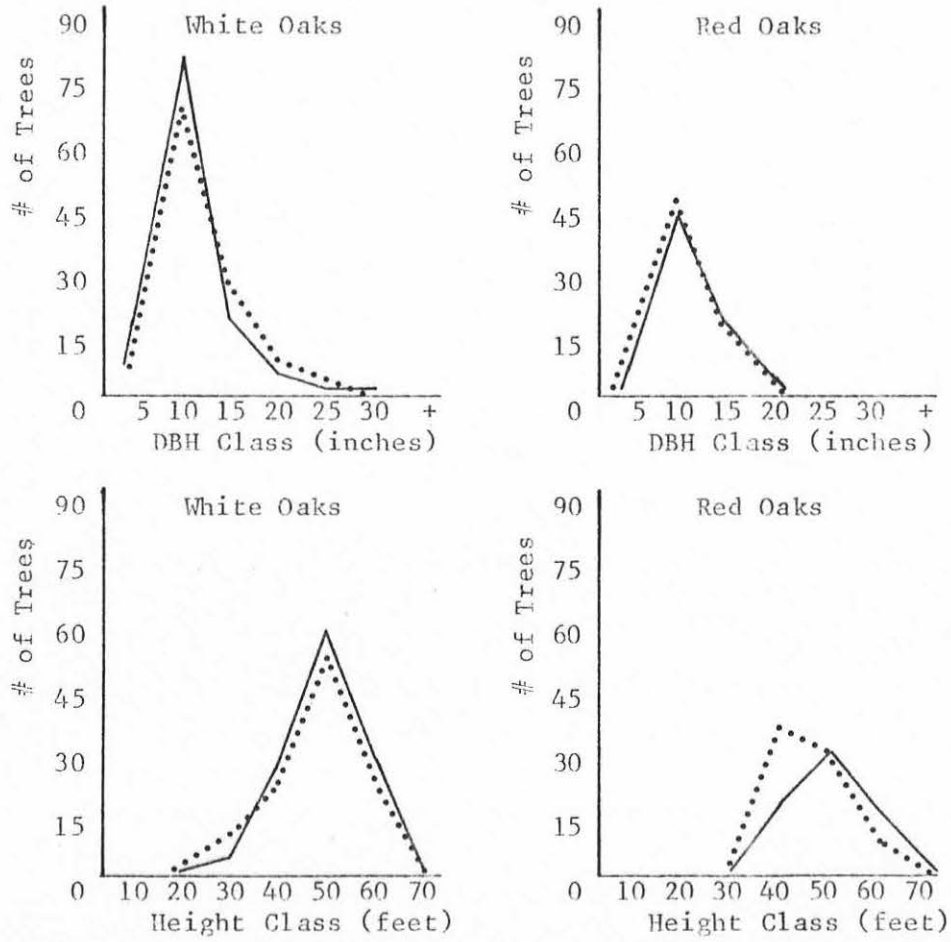


Figure 3. Distribution of live (——) and dead (.....) oaks within DBH and height classes when separated into red and white oak categories.

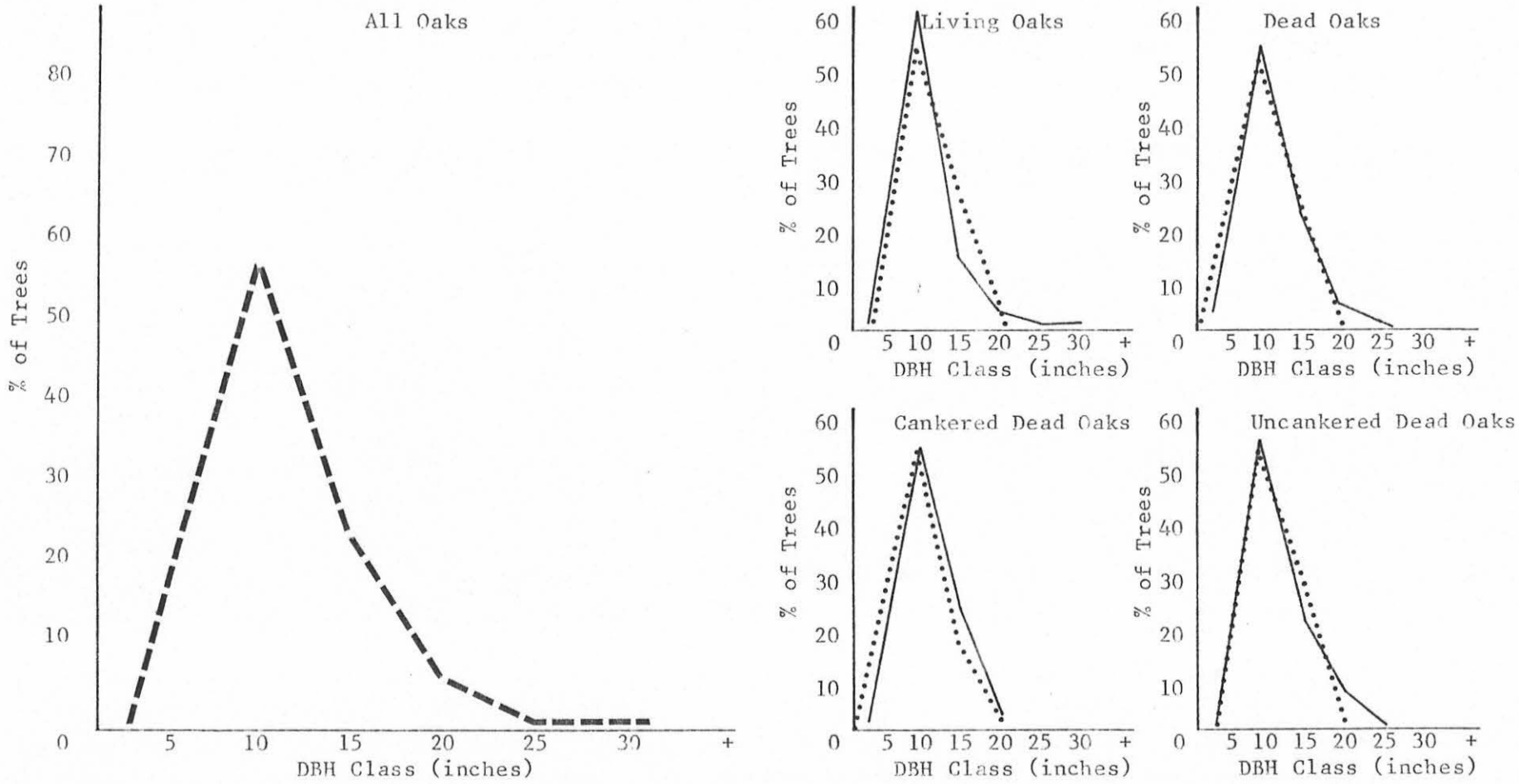


Figure 4. Population percentage distribution in 5" DBH classes for all (---), red (.....) and white oak (——).

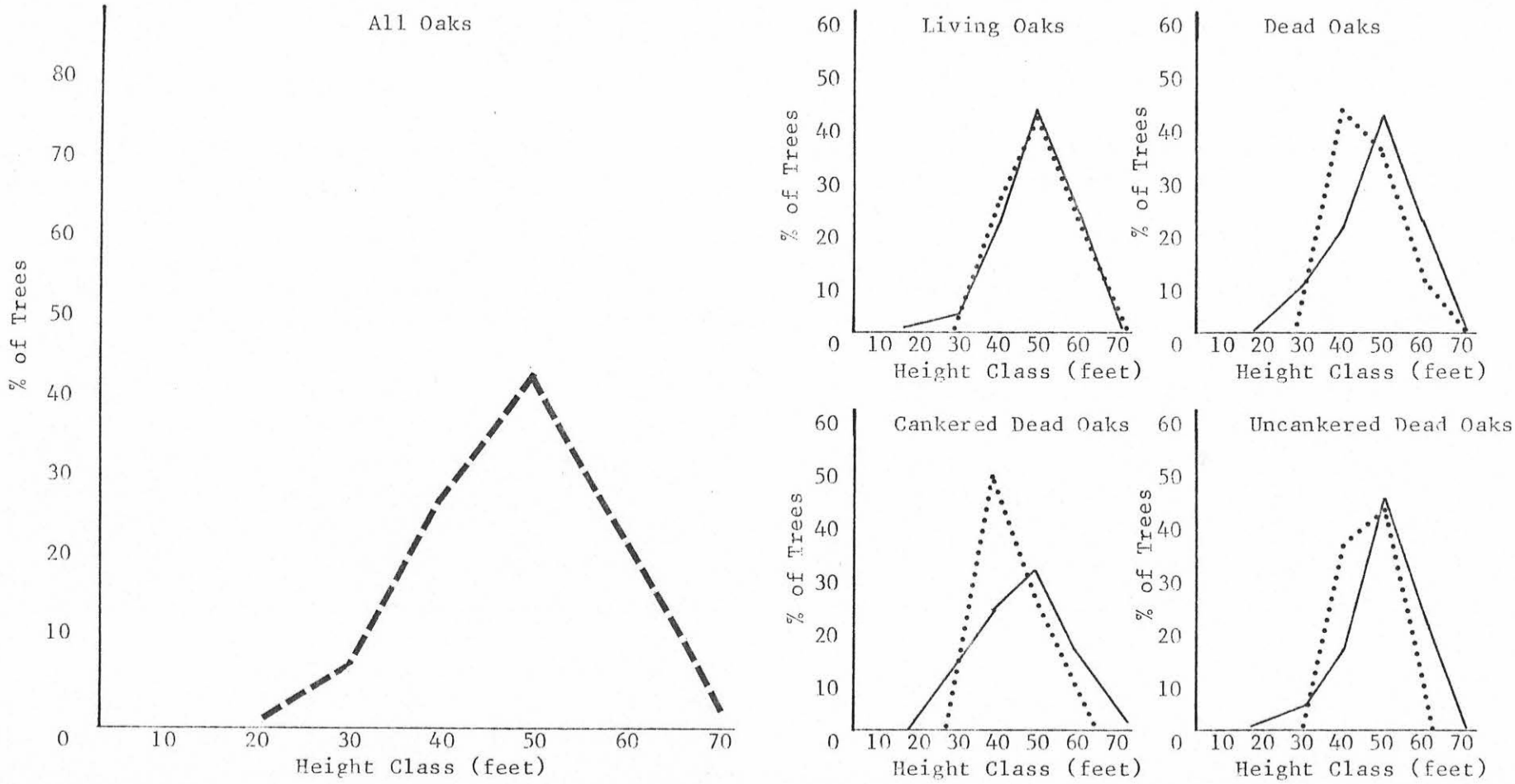


Figure 5. Distribution of population percentages for 10' height classes of all (---), red (.....) and white (——) oaks.

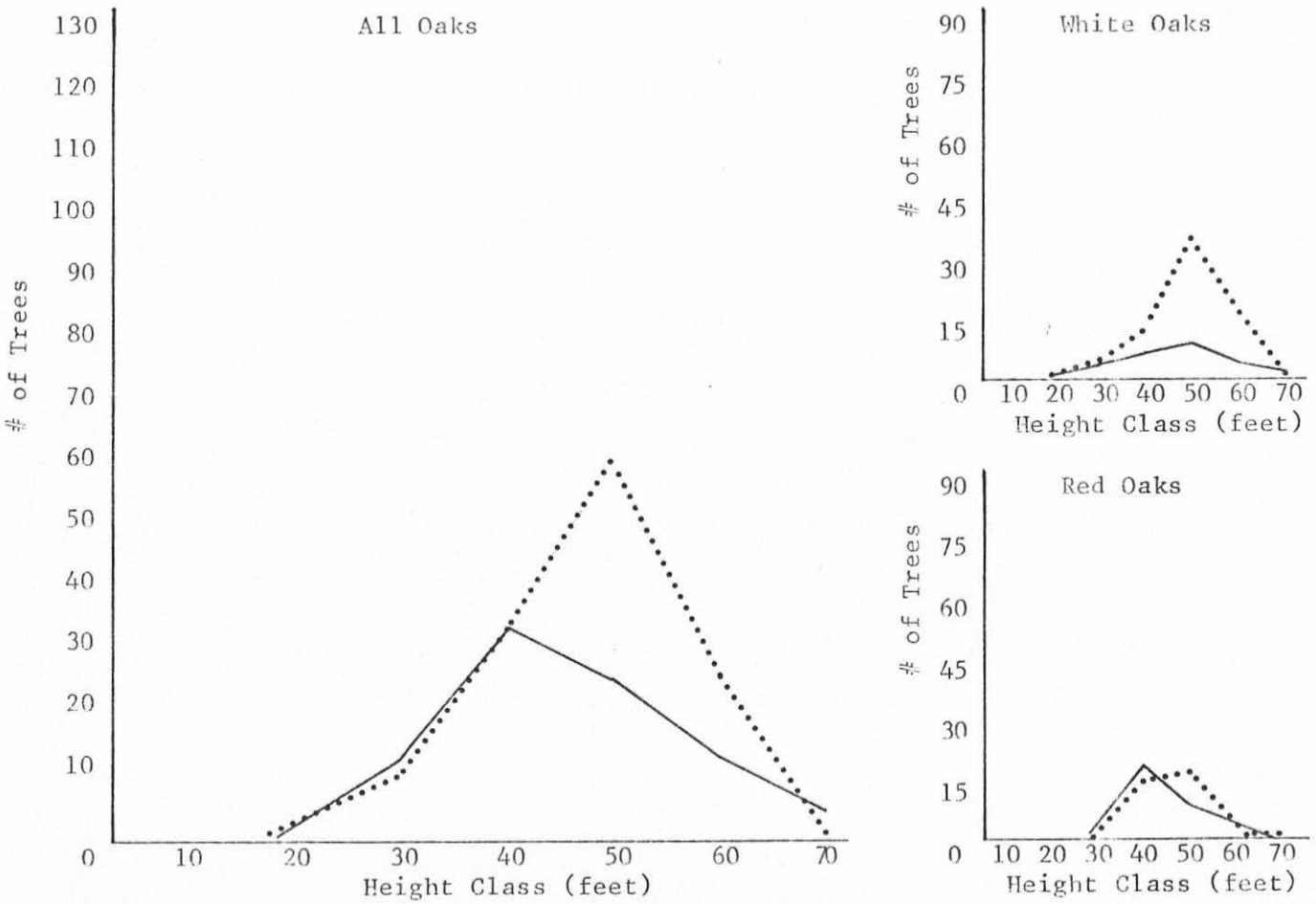


Figure 6. Comparison of height distributions for cankered (——) and uncankered (.....) dead oaks.

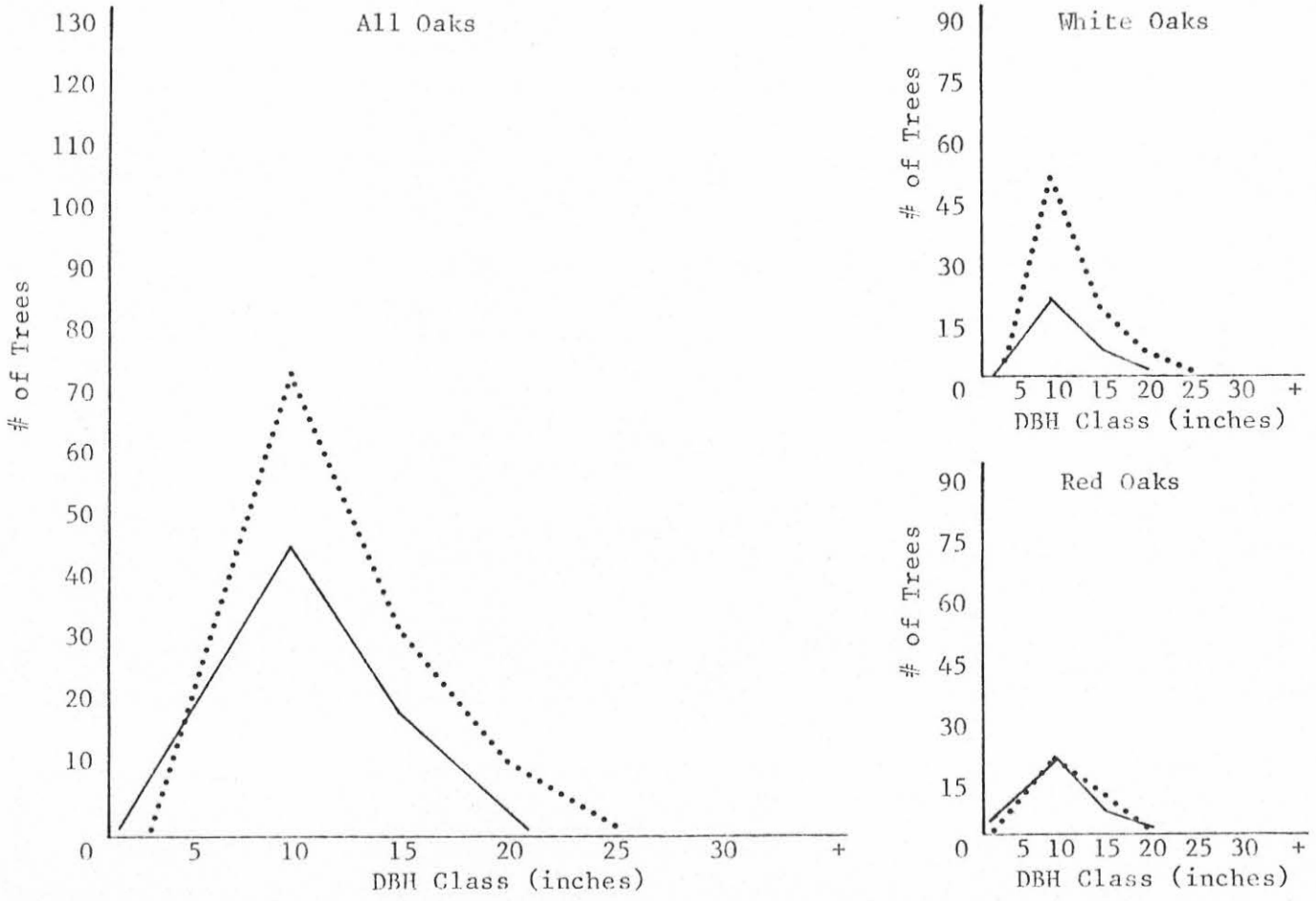


Figure 7. Comparison of diameter distributions for cankered (——) and uncankered (.....) dead oaks.

Figure 8. Standing oak showing extensive fruiting by Hypoxylon atropunctatum (Schw. ex Fr.) Cke. The grey discoloration of the bark is actually the fungal fruiting body.